

when the metastases reach the loose submucous tissue colloid or mucoid degeneration and distention are the marked feature and typically shown in the group of nodules in Class II. When we come to the four large cysts, which due to their unusual appearance led to this investigation, they are evidently an exaggeration of the mucoid degeneration seen in the second group, with complete destruction of the mucoid secreting epithelium. This can be pretty safely assumed because of the similarity of the cystic contents and the location of the lesion in the submucous coat.

Whether or not the cysts became infected with the gas-forming bacteria long enough before death to partly account for their large size it is impossible to say, but not unlikely. Therefore it appears that these large cysts which grossly were at first thought to be an independent lesion are only a peculiar manifestation of degenerative processes in the original carcinomatous metastases.

The distribution of the metastases is also interesting; they are confined to the gut, peritoneal glands, omentum and the hilus of the liver indicating a dissemination through the peritoneal lymphatics and in this way resembling some cases of tuberculosis.

I wish to express my thanks to Professor Oertel for his kind criticism.

#### **THE VALUE OF VENTRICULAR PUNCTURE FOR THE EARLY DIAGNOSIS AND SERUM TREATMENT OF POSTERIOR BASILAR MENINGITIS.**

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THE results obtained about a year ago in the treatment of two babies suffering from posterior basilar meningitis who were admitted to the Willard Parker Hospital are of sufficient interest to justify a short discussion of certain features of the disease and a detailed presentation of the clinical and laboratory reports of the cases. In the literature several late cases of posterior basilar meningitis are reported who recovered after ventricular punctures and injections of antimeningitis serum. No particular attention seems, however, to have been drawn in any of the communications to the importance of an early diagnosis before the progressive character of the symptoms had established the diagnosis beyond a doubt, at which time more or less damage to the brain tissue had already taken place.

The difficulty of recognizing the disease in its early stages, the late complication of an internal hydrocephalus and the resulting high

mortality point to the necessity of utilizing all the available early and often slight symptoms, so as to establish an accurate diagnosis and institute prompt serum treatment by means of ventricular puncture. In antimeningitis serum we have an excellent specific remedy for meningococcus meningitis; it must, however, be injected if it is to be fully efficient in the early stages of the disease and into those places where it will be most active.

The pathological anatomy of posterior basilar meningitis shows that the disease is characterized by a yellow fibrinopurulent exudate which fills up the cisterna magna, spreads downward for a variable distance along the posterior aspect of the cord and forward along the base of the brain so far as the interpeduncular space, the optic chiasm and the tips of the temporosphenoidal lobes.

The early symptoms of the disease in infants below six months of age are not very definite and the diagnosis is often difficult to establish. The only symptoms present may be fine tremors of the extremities, temperature 100° to 104° F., and, of special importance, a slight bulging of the anterior fontanelle. The bulging of the fontanelle in an infant who is quiet and breathing regularly should arouse suspicion and lead to a diagnostic lumbar puncture, especially if one or more of the other symptoms are also present. The results of lumbar puncture in cases of posterior basilar meningitis, in which there is generally an exudate covering and closing the foramina of Magendie and Luschka, may be significant in one of several ways: The lumbar puncture may yield (a) a dry tap, (b) a few drops of clear sterile spinal fluid or (c) 1 to 2 c.c. of purulent fluid. This pus represents some of the material which had formed and settled down in the lower part of the spinal canal before the openings between the fourth ventricle and subarachnoid space in the spinal cord became closed by inflammatory exudate. The diagnosis is readily established in the last group of cases by examining the purulent spinal fluid. Very little of this fluid can be withdrawn, however, and little if any of the antimeningitis serum injected. The indications then become very definite for a ventricular puncture, the removal of a larger amount of fluid and the reinjection of a suitable amount of serum.

In the group of cases, however, that show clinically a slight bulging anterior fontanelle, but give a dry tap or a few drops of sterile spinal fluid on lumbar puncture, the diagnosis remains in doubt. We might hesitate before proceeding to the somewhat more radical procedure of a ventricular puncture. It would be, however, a mistake to wait for the development of the more marked symptoms of a progressive meningitis, such as opisthotonos, retraction of the head and internal hydrocephalus. These symptoms represent more extensive and often irreparable damage to the brain tissue. In the presence of a bulging fontanelle a dry tap in the hands of one who is expert in lumbar punctures, especially if it also follows a second or a third attempt,

should be a clear indication for making a ventricular puncture to establish the necessary diagnosis. A true dry tap can almost always be established by leaving the lumbar puncture needle in place, inserting a second needle into the next space higher up (between the third and fourth lumbar vertebrae) and, after waiting to see if any spinal fluid will escape, allowing some sterile saline to flow into one of these needles. The saline solution will escape through the other needle, showing that both needles have been properly inserted into the subarachnoid space of the spinal canal.

If the case has not been properly treated in the early stages of the disease by ventricular punctures and injections of serum a group of symptoms will gradually develop in the course of the next ten to fourteen days, which are very characteristic but indicate that more or less damage has already taken place. There is an increasing rigidity of the neck, retraction of the head and a moderate or marked opisthotonos. The extremities become extended and spastic, the hands pronated and clenched and the legs adducted and at times crossed. In other cases there may be flexion of the limbs at the various joints. The development of hydrocephalus is indicated by tense and bulging open fontanelles. Dilated pupils, strabismus and sometimes blindness are other symptoms that develop in the later stages. Fever and projectile vomiting are present, and finally death takes place, with progressive emaciation, which is quite a feature of the disease. If the infant should recover from the acute stage of the illness it will, as a rule, develop a permanent hydrocephalus, associated with an impairment of one or more of the sense organs.

In adults cases are occasionally seen that require trephining, ventricular puncture and injection of serum. These patients begin with an ordinary attack of cerebrospinal meningitis and are treated by lumbar punctures daily for possibly a week or ten days. The spinal fluid becomes sterile after the second or third lumbar puncture, but it continues more or less turbid. The clinical symptoms persist and become aggravated. If the patient is conscious he complains of intense headache. There is frequently delirium. The pupils are contracted and the fundi show congested or edematous disks. The explanation for this complication lies probably in the fact that the foramina of Magendie and Luschka have become closed by the plastic exudate over the base of the brain while the space between the spinal cord and the foramen magnum has remained clear. This results in a retention of ventricular fluid containing meningococci and a dilatation of the ventricles of the brain, while the cerebrospinal fluid produced in the subarachnoid space passes freely down into the spinal canal and appears by lumbar puncture. The anti-meningitis serum injected by lumbar puncture can only reach and sterilize the subarachnoid space of the cerebrospinal axis. To reach the ventricles these patients have to be trephined, the lateral ven-

tricles punctured and the serum injected. The puncture and injection of the serum will have to be repeated several times.

In another group of adult cases the patients have gotten over the most acute symptoms and the spinal fluid has begun to clear up distinctly, when there suddenly begins a rapid aggravation of symptoms and the patients complain of intense headache. The eye-grounds show congested or even edematous disks. The spinal fluid is sterile in culture but slightly turbid. If a ventricular puncture is made the fluid is found distinctly less turbid than the spinal fluid and also sterile in culture. In these cases the acute bacteriological infection has stopped both in the ventricles and in the subarachnoid space of the cerebrospinal axis, but the exudate at the base has gradually closed the foramina of exit from the fourth ventricle and the ventricles in the brain are becoming acutely dilated. Repeated ventricular punctures without the injection of serum are indicated in the treatment of these cases. These punctures are made, according to the method of Kocher, through a small trephine opening 2.5 cm. from the median line and 3 cm. in front of the coronal suture. The needle is passed inward and slightly backward for a distance of about 4 or 5 cm., when the lateral ventricle will be reached.

The differential diagnosis in infants must take into consideration the following diseases:

- (a) Tubercular meningitis and the different forms of septic meningitis.
- (b) Meningismus.
- (c) Pneumonia.
- (d) Poliomyelitis and polioencephalitis.
- (e) Meningeal hemorrhage.

**DIAGNOSIS.** The diagnosis is established by lumbar puncture and the examination of the spinal fluid. If there is a dry tap and the patient shows a bulging fontanelle a ventricular puncture is indicated. In adults the persistence or aggravation of the clinical symptoms and a cloudy but sterile spinal fluid indicate a ventricular puncture.

**PROGNOSIS.** The prognosis depends to a great extent upon the stage of the disease in which the diagnosis is established and the serum injected into the ventricles. One of the two cases reported in this communication was treated for three weeks with small injections of antimeningitis serum into the spinal canal. The ventricular fluid obtained from the infant at the end of this time showed a great many meningococci, indicating that the spinal injections of the serum had had very little if any effect on the course of the disease. Three ventricular injections of antimeningitis serum, given at intervals of twenty-four hours, produced a sterile fluid, but the disease had progressed too far and the patient finally died, with marked emaciation. The second patient was treated in the early stages of the disease and recovered completely. The prognosis would seem to

depend therefore, to a considerable extent, upon the time when the diagnosis is made and proper treatment instituted.

**TREATMENT.** The treatment consists of puncture, daily or every other day, of the lateral ventricles, withdrawal of the fluid and reinjection of a suitable amount of antimeningitis serum. The interval between each puncture and the total number of punctures will depend upon the clinical course and the examination of the ventricular fluid. From four to six punctures and injections of serum may be required. The amount of fluid withdrawn from the ventricles varies from 20 to 50 c.c. and the amount of serum injected from 15 to 35 c.c. The treatments are not discontinued as soon as the ventricular fluid is found sterile on culture, but one or two additional serum injections should be given. Cases of meningococcus meningitis are occasionally observed that are not treated sufficiently with serum and subsequently show relapses, as indicated by an increased temperature and reappearance of positive meningococcus cultures in the spinal fluid, even though the latter had for a few days been negative in cultures.

The technic of ventricular puncture is simple but requires certain precautions. The infant should be wrapped in a sheet and placed in the dorsal position, with the head brought near the edge of the table. The area over and around the anterior fontanelle is shaved, if necessary, and sterilized with tincture of iodine. One assistant holds the head of the infant firmly between his hands and another one secures its body. The operator sits at the head of the table. The lumbar puncture needle used in this operation should preferably be not larger than a No. 18 gauge, three inches long and have a short bevelled point (George Tiemann & Co.). The needle is introduced through the anterior fontanelle on a horizontal line connecting the two lateral angles, 1 cm. from the middle line, in order to avoid injuring the longitudinal sinus. It is passed to a depth of from 2 to 5 cm., when the lateral ventricle will be readily reached. The direction of the needle from its insertion through the scalp is almost perpendicular but slightly outward and forward. The needle is held very gently and supported, rather than firmly fixed, between the fingers. The plunger in the needle is removed and the ventricular fluid allowed to escape into a test tube, which is held by an assistant. If the fluid flows out too rapidly its escape may be temporarily stopped by partly reintroducing the plunger into the needle. The small size of the needle will avoid too rapid a removal of the ventricular fluid and injection of serum as well as unnecessary trauma of the brain tissue. After withdrawing the fluid from the ventricle a gravity outfit, consisting of the barrel of a 10 to 20 c.c. syringe and connecting rubber tubing, is attached by an assistant to the needle and the antimeningitis serum, previously warmed to body temperature, is slowly injected. Care should be taken to reinject less fluid than is removed. At the end of the operation the needle is

gently withdrawn and a sterile dressing applied. It is not necessary or advisable to wash out the ventricle with salt solution before the injection of the serum. For repeating the injection it is preferable to use the other ventricle. Each specimen of fluid withdrawn is carefully examined by smears and bacteriological cultures.

The infant should be kept in the hospital under observation for at least four weeks after convalescence has set in. Before discharging the patient a lumbar puncture should be made to see whether a clear spinal fluid can be obtained. This would indicate the reestablishment of the communication through the foramina of Magendie and Luschka between the ventricular cavities in the brain and the subarachnoid space in the spinal canal.

Every effort should be made to have the breast feeding continued during the patient's stay in the hospital. This is an important feature of the treatment, as changing to bottle feeding is likely to greatly diminish the chances of the infant's recovery. After the patient has been discharged from the hospital, observations should be continued for a period of several years to determine any possible impairment of the mentality or of any of the special sense organs.

The following are the records of the two cases treated at the Willard Parker Hospital. The contrast in the final results, due to the institution of proper treatment at different stages of the disease, illustrates quite definitely the necessity of early ventricular puncture for diagnosis and treatment.

CASE I.—Frank S. (Chart I). Patient, aged two and a half months, was admitted to the hospital on May 9, 1917. Had been ill for eighteen days previous to admission. The patient presented the typical clinical picture of an advanced basilar meningitis. There was marked retraction of the head, opisthotonos, spasm of the limbs and bulging of the anterior fontanelle. The patient was first seen at home by a physician connected with the meningitis division of the Department of Health. A lumbar puncture was made but it resulted in a dry tap. Two other punctures were made at subsequent visits, but each time only a few drops of sterile bloody fluid were obtained. After admission to the hospital on May 9 (nineteenth day of disease) four more lumbar punctures were made, which again only resulted in a few drops of sterile spinal fluid. At each lumbar puncture a few cubic centimeters of antimeningitis serum were injected intraspinally.

The patient showed no clinical improvement during this time. His condition became rapidly worse; the opisthotonos was more marked, the anterior fontanelle showed greater bulging and the child was becoming progressively more emaciated.

May 15 (twenty-fifth day of disease). First ventricular puncture was made; 45 c.c. turbid fluid obtained, containing numerous meningococci in smears and cultures; 20 c.c. antimeningitis serum injected by gravity.

May 16 (twenty-sixth day of disease). Anterior fontanelle bulging. Second ventricular puncture; 45 c.c. turbid fluid withdrawn, showing several colonies in culture; 20 c.c. antimeningitis serum reinjected.

May 17 (twenty-seventh day of disease). Third ventricular puncture; 40 c.c. slightly cloudy fluid withdrawn, which showed only one colony in culture; 18 c.c. antimeningitis serum reinjected.

May 18 (twenty-eighth day of disease). Fourth ventricular puncture; 10 c.c. slightly cloudy fluid obtained, which was sterile in culture. No serum injected.

May 20 (thirtieth day of disease). Fifth ventricular puncture; 30 c.c. almost clear fluid obtained, which was sterile in culture; 20 c.c. antimeningitis serum reinjected by gravity.

May 21 (thirty-first day of disease). Patient died. Toward the end the patient showed marked marasmus.

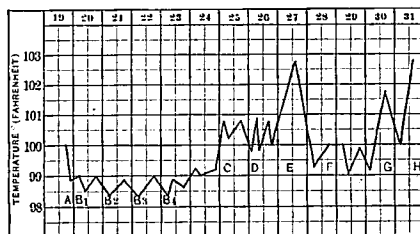


CHART I.—Frank S. (Case I). A, lumbar puncture; 15 c.c. blood-tinged fluid withdrawn; B<sub>1</sub>, lumbar puncture; few drops of blood-tinged fluid withdrawn; B<sub>2</sub>, lumbar puncture; few drops of blood-tinged fluid withdrawn; B<sub>3</sub>, lumbar puncture; few drops of blood-tinged fluid withdrawn; C, first ventricular puncture; 45 c.c. of turbid fluid withdrawn; 20 c.c. serum; D, second ventricular puncture; 45 c.c. of turbid fluid withdrawn; 20 c.c. serum; E, third ventricular puncture; 40 c.c. of slightly turbid fluid withdrawn; 18 c.c. serum; F, fourth ventricular puncture; 10 c.c. of slightly turbid fluid withdrawn; G, fifth ventricular puncture, 30 c.c. almost clear fluid withdrawn; 20 c.c. serum; H, patient died.

CASE II.—Giulietta M. (Chart II). Two and a half months old. Admitted to the hospital May 13, 1917. Ill for three days before admission. Symptoms slight and not characteristic. Temperature, 100° F.; occasional tremors of upper and lower extremities; slight but distinct bulging of anterior fontanelle even when the baby was quiet. No rigidity of neck or Kernig's sign. On day of admission a lumbar puncture gave 2 c.c. of purulent fluid containing numerous meningococci in smears and cultures. Several other lumbar punctures were made on the same day and on the following morning but no more spinal fluid could be withdrawn nor could the antimeningitis serum be injected into the spinal canal; 20 c.c. of serum were therefore given subcutaneously on the day of admission.

May 14 (fourth day of disease). First ventricular puncture; 15 c.c. of cloudy fluid withdrawn, which showed numerous meningococci in smears and culture; 10 c.c. serum reinjected.

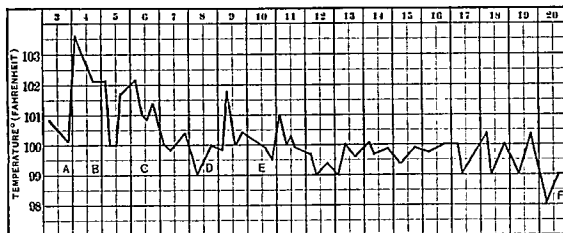


CHART II.—Giulietta M. (Case II). A, lumbar puncture; 2 c.c. purulent fluid, containing meningococci; 20 c.c. antimeningitis serum given subcutaneously; B, first ventricular puncture; 15 c.c. of turbid fluid withdrawn; 15 c.c. serum injected; C, second ventricular puncture; 20 c.c. of turbid fluid withdrawn; 10 c.c. serum injected; D, third ventricular puncture; 40 c.c. of turbid fluid withdrawn; 15 c.c. serum injected; E, fourth ventricular puncture; 40 c.c. of slightly turbid fluid withdrawn; 20 c.c. serum injected; F, lumbar puncture; 10 c.c. of clear spinal fluid, sterile in culture.



FIG. 3.—Giulietta M., three months after the attack.



May 16 (sixth day of disease). Anterior fontanelle bulging; second ventricular puncture made; 20 c.c. turbid fluid obtained, showing a smaller number of meningococci in smears and culture; 10 c.c. serum reinjected.

May 18 (eighth day of disease). Third ventricular puncture; 40 c.c. slightly turbid fluid obtained, sterile in culture; 15 c.c. serum reinjected.

May 20 (tenth day of disease). Fourth ventricular puncture; 40 c.c. slightly turbid fluid withdrawn, which was sterile in culture; 20 c.c. serum reinjected.

May 31 (twenty-first day of disease). Lumbar puncture; 10 c.c. clear spinal fluid obtained, which was sterile in culture. Patient discharged from the hospital.

During the course of the disease the patient developed a slight retraction of the head, which was hardly noticeable, however, at the time of discharge from the institution. The breast feeding was continued during the entire time. It is interesting to note that a nasal culture made on May 16 (sixth day of disease) showed the presence of meningococci.

Fig. 3 was taken three months after the patient was discharged from the hospital. The examination at that time showed that the baby was apparently normal and had made a complete recovery.

A second reexamination of the patient was recently made (one year after the attack) and the baby was found to be apparently normal and to have made the usual progress in its mental and physical development.

**SUMMARY AND CONCLUSIONS.** 1. A prompt ventricular puncture is indicated in cases that show progressive meningeal symptoms and give a dry tap on lumbar puncture. In some patients the lumbar puncture may show a few drops of purulent spinal fluid, but a sufficient amount cannot be withdrawn, even by aspiration, with a syringe, and little or no antimeningitis serum can be injected.

2. Even less pronounced meningeal symptoms, such as slight but definite bulging of the anterior fontanelle, tremors of the extremities and fever should lead to a ventricular puncture in cases that have given repeated dry taps in the hands of an experienced operator. Such early ventricular punctures are of vital importance in the successful treatment of cases of posterior basilar meningitis.

3. In adults the persistence or aggravation of the clinical symptoms, associated with a persistently cloudy spinal fluid, which has become sterile after two or three injections of antimeningitis serum, indicate in many cases the necessity for a ventricular puncture. In these patients the lumbar puncture may show a sufficient amount of spinal fluid, but the outlet from the ventricles is closed off and the serum injected into the spinal canal does not reach these infected regions.

4. Ventricular punctures should be repeated daily or every other

day; 20 to 50 c.c. of fluid are withdrawn and 15 to 30 c.c. of serum injected by gravity. The serum should be warmed to body temperature and a smaller amount always reinjected than the amount of fluid withdrawn. Three assistants are generally necessary to carry out the operation carefully and safely.

5. The interval of time between the punctures and the total number of punctures will depend upon the rapidity in the reaccumulation of the fluid, as indicated clinically by the reappearance of a bulging anterior fontanelle and upon the result of the bacteriological culture of the ventricular fluid.

6. A lumbar puncture should be made at the time the patient is discharged from the hospital in order to determine the reestablishment of the communication between the ventricular cavities in the brain and the subdural space in the spinal canal.

7. If the baby is breast-fed every effort should be made to have the breast feeding continued while the patient remains in the hospital.

8. Occasionally the diagnosis may be assisted in cases giving a dry tap, and before deciding upon a ventricular puncture, by making a culture of the nasal discharge and finding the meningococcus present.

9. Cases of posterior basilar meningitis should be followed up for a period of years to determine the final outcome in those who recover after ventricular punctures and injections of antimeningitis serum.

#### LITERATURE.

1. Cushing, H., and Sladen, F. J.: *Jour. Exp. Med.*, 1908, x, 548.
2. Fisher, L.: *New York Med. Jour.*, 1910, xci, 625.
3. Netter and Debre: *La meningite cerebrospinale*, Paris, 1911, 272.
4. Bouche, G.: *Jour. med. Bruxelles*, 1912, xvii, 61.
5. Neven-Lemaire, Debeyre and Rouviere: *Compt. rend. Acad. sc.*, 1916, clxii, 885.
6. de Verbizier, A., and Chauvele, F.: *Bull. et m d. Soc. m m.*, 1916, xxxii, 1138.
7. Kortweg, R.: *Nederl. Tydschr. Geneesk.*, 1917, i, 1340 (abstracted in *Jour. Am. Med. Assn.*, 1917, lxi, 160).
8. Sophian, A.: *Am. Jour. Dis. Children*, June, 1917.

### PRIMARY CARCINOMA OF THE GALL-BLADDER: AN ANALYSIS OF TWENTY-THREE PROVED INSTANCES OF THE DISEASE.<sup>1</sup>

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In the series of 1000 operatively and pathologically demonstrated instances of gall-bladder disease which I reviewed a year

<sup>1</sup> Read at the Twenty-third Annual Meeting of the American Gastro-enterological Association, Atlantic City, N. J., May 6 and 7, 1918.